



A Zebra Technologies White Paper

Improve Field Service Productivity and Cost-Effectiveness with Mobility Technology



The Case for Automating Field Service Operations

For many organizations, field service operations are the last frontier where enterprise information systems, labor controls, and productivity tools have yet to yield results. Cell phones provide some visibility into field operations and give service staff the ability to inquire about customer records, but cell phones alone provide little overall productivity benefit. For one reason, they do nothing to reduce the non value-added time technicians spend preparing invoices, filling out work orders, and providing other documentation.

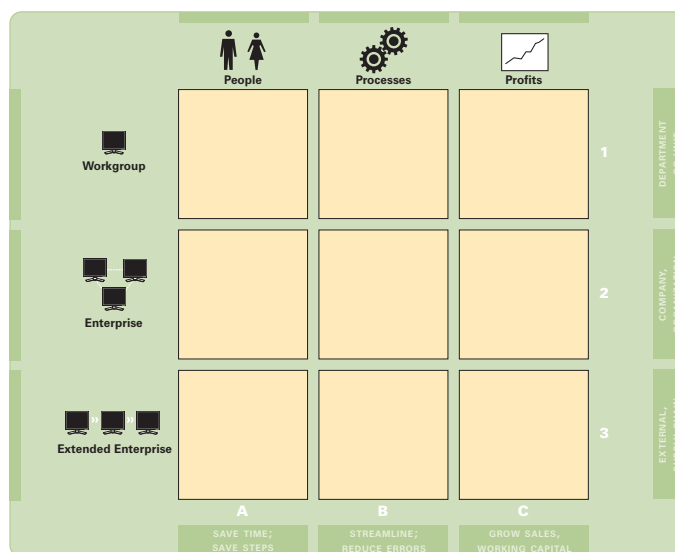
In the office, record keeping and correspondence executes on computers, thus allowing easy sharing and exchanging of information with other departments. In the field, technicians commonly complete paperwork by hand, which provides no automation benefits or time savings, and requires additional data entry time later in the office.

In fact, companies with best-in-class field service operations complete about eight percent more work orders per day than average performers, have 12.5 percent higher service level agreement (SLA) compliance rates, and are 2.5 percent more profitable¹. In addition, only 22 percent of best-in-class organizations still use paper-based processes in field service operations². Obviously, there is a connection between eliminating paperwork in the field and improving operations throughout the enterprise. Unfortunately, for many managers, this connection is still unclear, thus making it hard to win approval for automation projects.

This white paper discusses key considerations when selecting mobility solutions, and unveils how mobility-enabled operations can improve field service efficiency, reduce operating expenses, and boost customer satisfaction.

Evaluating the Business Value for Mobility Technology

Zebra developed the Zebra Business Value Map to help identify, classify, and categorize the benefits of mobility technology across field service operations. The map relates how mobile computing and printing applications affect people, processes, and profits.



1. The Aberdeen Group, "Mobile Field Service Update 2007 and Beyond," 2007.
 2. Ibid.

To make the Zebra Business Value Map relevant to a company’s unique operations and identify areas for improvement, consider the following questions:

- How much time do field service technicians spend filling out work order records and preparing invoices?
- How much money does the organization spend annually on preprinted forms?
- Are service parts inventory records accurate? Do inaccuracies cause problems in the field? What happens in the office when handwritten work orders and invoices are not legible?
- How much time do employees spend on data entry, both in the field and in the office?
- How often do customers call about billing disputes?
- How long does it typically take to resolve these questions? Which departments are involved?
- Can workers easily change dispatching and job priorities throughout the day?
- How would operations benefit if technicians could complete more calls per day?
- How do customers rate the organization’s service?

Mobility Considerations—Standards, Scalability, Reliability

Mobility solutions for field service operations include mobile computers (handheld or laptop) running application software, mobile thermal printers, and wireless network connectivity. For each technology, be sure to choose the solution with the optimal support of standards, scalability, reliability, and security.

	Application-level Integration	Mobile Computer	Portable Printer
Standards	Operating systems (Microsoft® Windows Mobile®, Windows® CE) and programming languages (XML, HTML)		Thermal printing options (4" wide with a variable length)
Scalability	Easy to add additional devices and users	Expansion ports and networking	Bar code and RFID printing
Reliability	Superior reliability of application software that includes error alerting and power load balancing	Ruggedness and durability for mobile field usage	
Security	Strong wireless and data encryption		

Mobility Technology Delivers Essential Business Value

To visualize how mobility solutions enhance field service operations, the following section summarizes the benefits achieved by Zebra customers, and places them within the Business Value Map.

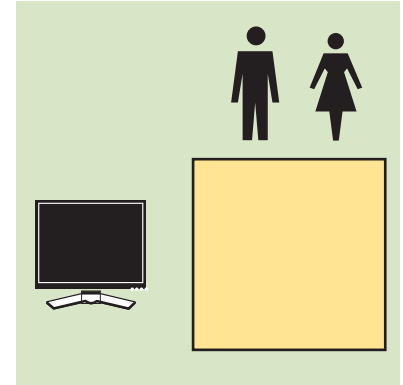
Realize Increased Workgroup Productivity—People

The most consistent benefits from field service automation are time savings and improved productivity. Mobile computing and mobile printing applications slash the time required to fill out and issue work orders and invoices. Organizations are often surprised to learn how much paperwork workers complete in the field

influences other operations, so when they measure their paperwork-related activities, the value of field service automation often becomes clear.

Mobile printers are a powerful complement to other automation efforts that reduce non-value added time spent on service calls. After implementing a mobile printing solution, McMahon Cartage, a Chicago-area gasoline distributor, noticed a significant improvement in its billing process due to clear, error-free printing. In addition, route drivers complete their paperwork 80 percent faster—a huge plus for drivers, who can now spend more time concentrating on driving and servicing their customers. See the complete case study at www.zebra.com.

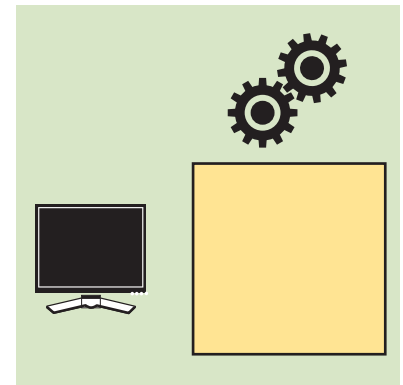
In a non-automated environment, field service technicians typically fill out invoices and work orders out by hand on three-part forms. Notes or special instructions may be crammed in the margins or written on separate notepaper, which can be lost or separated from the actual invoice. Completing invoices on a mobile computer instead of on manual forms saves time because software can automatically populate customer information and other fields, and drop-down menus simplify other activity. At the workgroup level, the department benefits from improved productivity.



Improve Workgroup Accuracy—Processes

Improved accuracy is a major benefit of automating field service processes. By using a mobile computer application with preloaded customer information, equipment service histories, configuration settings, and other information, technicians can save time in the field. Most software applications require users to verify data if they attempt to enter questionable or erroneous activity codes, labor time, parts quantities, or other information.

Changing processes to produce work orders, invoices, and other documentation on demand instead of preprinting at the start of the day saves time, and improves accuracy because changes display in the printout. Mobile thermal printers make more process improvements possible. Users have the option of mounting them in the vehicle or choosing wearable or handheld models that save time by eliminating the trip to the vehicle to generate the paperwork.



Enhance Workgroup Efficiency—Profits

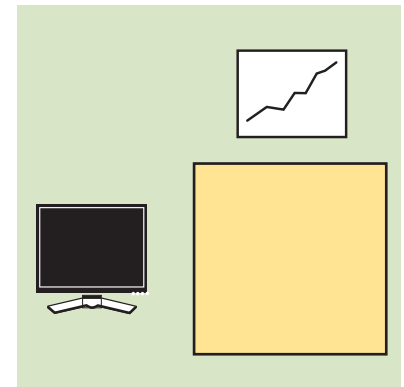
The productivity and process improvements mobile workers get from handheld computing applications translate into more profitable field operations. Mobile automation projects consistently reduce operating expenses. They also hold strong potential to help increase revenues. Improved field service productivity is the key. Aberdeen found the mean time to complete repairs for automated, best-in-class companies is 20.3 percent faster than average performers, and SLA compliance is at 91.2 percent³. With automation, field service technicians can complete more stops per day, which improves customer responsiveness, return on assets, and cash flow.

Consider Medallion Cabinetry, a residential cabinet manufacturer. Inefficient processes resulted in significant time delays in receiving delivery documentation. Drivers collected a delivery receipt and mailed it back to corporate headquarters, which required manual scanning into the system. Waiting for receipts, Medallion lacked the information required to respond to customer queries. After implementing a mobile computer and printing solution, the driver now enters the delivery transaction in a mobile computer, which sends a

3. The Aberdeen Group, "Mobile Field Service Update 2007 and Beyond," 2007.

command using its wireless interface to a Zebra® mobile printer to create a delivery receipt. Simultaneously, the wide-area radio inside the handheld computer sends a transmission to Medallion headquarters to update the host computer system in real time. The time savings in productivity add up, resulting in lower labor costs and improved customer loyalty. See the complete case study at www.zebra.com.

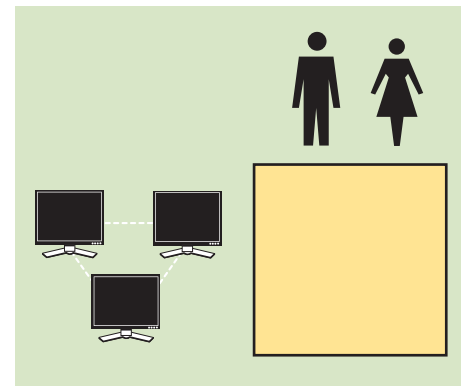
There is also a parallel benefit to office operations, because increases in field force productivity do not typically require additional billing clerks, customer service representatives and other support staff. There are also more immediate and quantifiable profit improvements. Simply replacing traditional invoices and other forms with less expensive thermal printer paper reduces operating costs.



Streamline Enterprise Tasks—People

Within field service organizations, enterprise-level staff includes service managers, dispatchers, billing clerks, customer service representatives, and other personnel who work with or support field service representatives. Even though these employees do not actually use the same mobile computers and printers used in the field, they still benefit from field service automation.

At the enterprise level, the main benefit of mobile technology is the reduction of labor needed for data entry and processing. Automated scheduling and work order management software provides tremendous time savings for managers and dispatchers, often enough to consolidate positions. Clerical workload reduces when field technicians record invoice data on mobile computers during their service call. They can then upload the information to update billing and inventory systems. There is no manual labor required to decipher handwritten work orders, invoices and notes, enter them into the appropriate systems, and file the original paperwork. Eliminating these tasks also reduces the opportunity to introduce errors.



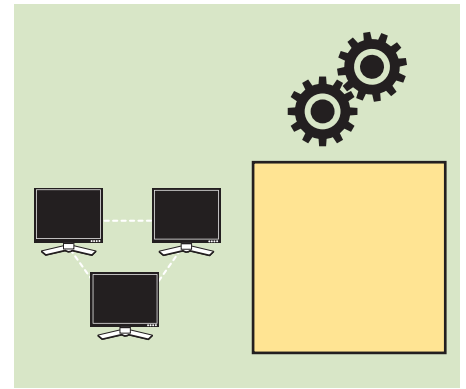
Save Time Within the Enterprise—Processes

Presenting customers with signed copies of work orders or other receipts is an effective tool for improving profitability and operational quality. Reviewing work orders during the service call, having customers sign them electronically on a mobile computer, and printing a signed copy of the document helps eliminate many of the misunderstandings that lead to customer dissatisfaction or service revenue write-offs.

To understand the power of accurate work order and invoice generation, companies first must understand how mistakes hurt their business. Assume a company employs 20 service technicians who each complete an average of 4.5 work orders each day, which adds up to 23,400 per year. Also, assume that customers question or dispute one out of 20 (5 percent) service invoices. That means the company must investigate and resolve 1,170 inquiries per year.

Suppose it takes 15 minutes to resolve each inquiry—a conservative estimate, considering the time required to listen to the customer's explanation, access the customer record, follow up with the technician, and potentially schedule a follow up call or credit the customer. The company would then spend 292.5 hours annually on inquiry resolution, or nearly one day a week for a full-time employee. If the service managers who investigate and resolve customer inquiries average \$20 per hour, the company would spend \$5,850 in labor alone for inquiry resolution.

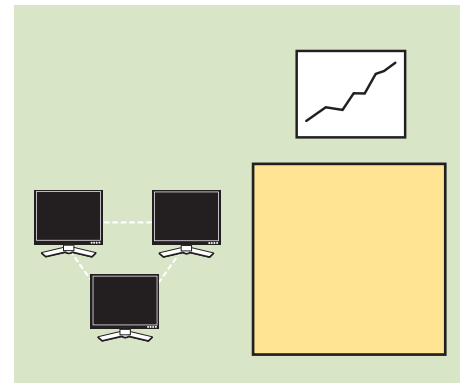
The \$5,850 expense does not include potential revenue lost for crediting the customer's account or for providing an unbilled follow-up call. Disputes are less likely to be resolved in the company's favor if it does not have documentation to back up its technicians. When details are not clear or paperwork is not legible, companies are more likely to accept the customer's version of events as a goodwill gesture and offer a refund or free future services. It is difficult to measure these indirect costs of poor documentation, but easy to see how they hurt profitability. For companies that earn a 15 percent profit margin on their service operations, removing \$5,850 in labor costs associated with inquiry resolution is the equivalent of gaining \$39,000 in new service revenue.



Boost the Enterprise Bottom Line—Profits

Reducing labor for non-value-added paperwork processing can clearly help profitability. When considering return-on-assets as a key profitability measure, field service automation is clearly beneficial because it helps organizations get more out of their highly trained, hard-to-replace technicians. Process automation also helps boost overall profits. Potential cash-cycle improvements, expanded coverage area, and new services are all vital areas when considering the value of field service automation.

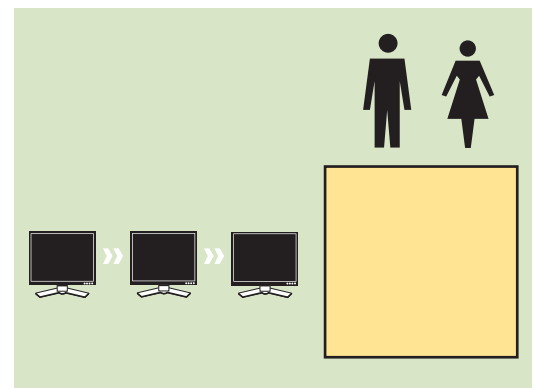
When workers record invoice and inventory information on a handheld computer, there is typically no lag time for recording it in the enterprise information systems. Companies with manual, paper-based operations typically cannot issue invoices for several days after performing the service. As a result, they operate at a billing- and cash-cycle disadvantage compared to companies with automated operations. Reducing information lag times also improves service parts inventory accuracy, which can help ensure technicians have the parts they need to complete service on a single visit.



Customers appreciate one-call resolution and accurate invoicing, so mobile automation plays a significant part in building customer satisfaction. Earning customer confidence can ultimately win more service calls and contracts.

Drive Value to the Extended Enterprise—People

Processes that make things easier for field service personnel also tend to make things easier for their customers. For example, customers value fast service and one-stop resolution because it helps them keep their facilities running and avoid overtime to make up for equipment downtime. Customers also benefit by receiving legible paperwork from field service representatives. The consistent print quality from thermal printers creates quality invoices, receipts, orders and other forms that customers can easily process, and will remain legible after processing and filing. Increasing the accuracy of transactions reduces customer-related inquiries, improves the level of professionalism, and saves time and effort when resolving customer service calls.

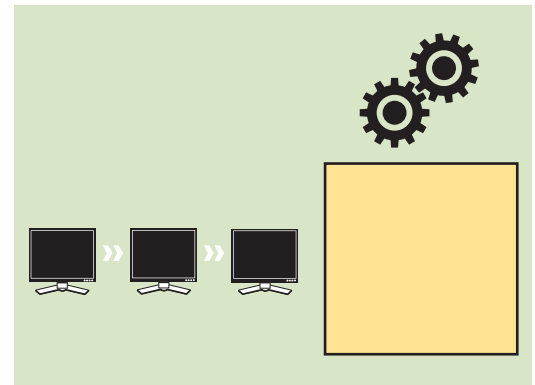


Refine Extended Enterprise—Processes

Automated systems that remind customers about regularly required service and maintenance help prevent unplanned interruptions and allow them to schedule service to minimize downtime. Proactively managing the service process helps customers maintain efficiency in their own operations.

Service staff can also use mobile printers to create reports, maintenance records, inspection seals, service reminders, and other documentation. All the required formats are stored in the printer memory, eliminating the need for mobile workers to carry numerous forms. Creating documentation electronically using inputs to a mobile computer is faster and more accurate than writing records on a clipboard, and eliminates the need for transcription and data entry at the office. The forms are also more legible and professional, which contributes to the firm's reputation for quality and helps avoid confusion and conflicts.

Studies have found leaders in service management automation are considerably more profitable, while the average manufacturing company misses 50 to 70 percent of potential service revenue because of poor record keeping and management. Service organizations can use mobile printers to create reorder and service reminder stickers, similar to oil-change reminder stickers placed inside vehicle windshields. These items keep the company in front of the customer after the representative leaves and helps build repeat business. Similar to service reminders, inspection labels leave behind a permanent record of service dates, providing documentation needed to resolve warranty claims. Businesses can leverage these simple reminders to build deep profit pipelines.



Lift Extended Enterprise Margins—Profits

Efficient service also helps customers become more efficient. Customers profit from field service automation initiatives by receiving reliable service, increased responsiveness and more uptime. When field service representatives are prompt, professional, and armed with the information they need, customers can spend less time directing them and more time on their primary responsibilities.

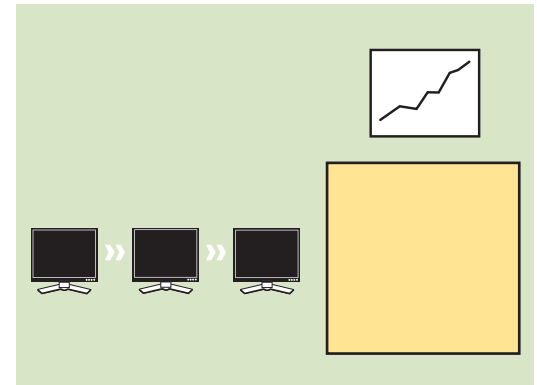
Printing invoices and work orders at the time of service gives technicians the opportunity to review them with customers, helping to prevent errors and disputes that are frequently time consuming and costly for office staff and managers to resolve. Businesses can supplement real-time invoicing with secure on-site payment processing to improve cash flow.

The alternative to on-site invoicing is for drivers to turn in piles of paperwork to billing clerks at the end of each shift. This creates another opportunity for errors to enter the system as clerks re-record the billing information. More significantly, it also adds costly delays to the billing cycle. Consider a technician who finishes their Monday shift and turns the daily invoices into the billing department. In the best case, the clerk enters the information into the billing system and mails the invoices the next day. The customer will receive them in the mail two or three days later—a total of three to four days after the visit. Companies that follow this standard business practice are thus at a three or four day cash-cycle disadvantage compared with their competitors that bill on site.

Mobile printers can accept payment on delivery, accelerating the cash-cycle advantage. Many companies routinely wait 30 days or more to pay invoices. Requiring payment on delivery eliminates the billing lag time and invoice processing delays, improving the cash cycle by at least a month. Mobile printers with integrated credit card readers make it convenient and simple to accept mobile payment and improve cash flow.

An emerging application is the use of wide-area wireless data networks for credit card payment authorization. Field service technicians swipe the credit card through a reader integrated into a Zebra printer, which transfers the data to a mobile computer or cell phone through either a cable or short-range wireless interface. The cellular network or other wide-area wireless data service transfers the credit authorization request, securely and efficiently in seconds. This eliminates the need for batch processing at the end of the shift. Zebra mobile printers offer WPA and WPA2 security, which meet the Payment Card Industry (PCI) Data Security Standard for payment card processing over wireless LANs.

On-site payment processing is also beneficial to companies because it reduces the resources needed to support the field service operation. Billing departments have fewer invoices to process and customer service has fewer calls to resolve because customers will review and approve invoices with their field service technician. Assuming billing inquiries take an average of 15 minutes to resolve, companies can save \$640 in invoice processing expenses for every 1,000 service calls, which breaks down to \$250 in reduced customer service labor and \$440 in postage at current rates. At a 15 percent margin, the savings is equivalent to \$4,267 in new service revenue.



Zebra Mobile Printers—Dependable and Flexible

Printers used in field service applications are typically thermal models wearable on a belt, utility strap, or secured in the vehicle. Thermal printers use heat to transfer the print image and have displaced impact as the dominant print technology used in mobile applications. This shift occurred due to thermal's outstanding reliability, ease of use, and superior total cost of ownership (TCO). Thermal printer solutions target a variety of mobile operations, whether users prefer vehicle-mounted or portable units, cable or wireless connectivity, and other features.

Zebra printers are available in a variety of designs to meet the needs and preferences of each mobile workforce. Mobile printers must be comfortable and easy to use or they will not deliver productivity benefits. While overall weight is important, balance, grip, and ease of carrying and operation remain vital. Several options exist for mobile printer portability such as belt clips, shoulder straps, and carrying cases of varying material from waterproof to lightweight nylon.

Save Money on Paper Supplies

On-demand mobile printing improves the professional look of receipts, service records and other paperwork given to customers, while also reducing form costs. It is increasingly acceptable to replace 8.5-by-11-inch three-part forms with smaller documents, which are easier to store and ultimately save the issuer money because less paper is used. Some companies use mobile printers to print variable information like invoice amounts or delivery contents on labels applied to forms. This satisfies customer desires to keep using familiar forms and saves time by eliminating handwriting and tedious manual recording.

Mobile printers can print text, logos, graphics, and bar codes on durable receipts, and labels of different sizes and thicknesses, and many have integrated magnetic stripe readers for payment card processing. Most models accept a variety of label, tag, ticket, and other media for producing durable receipts, invoices, return labels, inspection labels, security marks, and other labels. Top-coated media resists ultraviolet light and

remains readable for years, eliminating receipts that fade. Many types of liner-less media also exist, which eliminates the waste and disposal problems associated with peel-away liners used with adhesive labels.

Designed with common language support in mind, Zebra mobile printers enable users to print using the same commands as their legacy Zebra tabletop or desktop printers. While at the customer location, drivers can quickly print complex labels, bar code symbologies, and customized graphics that help differentiate their corporate identity.

Wireless Connectivity Enables Seamless Mobility

Mobile printers use two forms of wireless connectivity. Short-range wireless replaces the cable connected between a printer and mobile computer. Printers may also have a direct connection to enterprise wireless networks. Field service technicians can access wireless networks when they are at remote offices or other company facilities to receive their daily assignments and instructions, download customer lists and inventory records, and transfer transaction data at the end of the shift.

Using wireless for cable replacement improves ergonomics and productivity. Wireless systems are more reliable because there is no chance for printer cables and pin connectors to break. This is a tremendous advantage in field service operations, where users are often miles away from their headquarters and do not have immediate access to replacement parts. Bluetooth technology is very popular and effective for cable replacement because it provides excellent range, speed, and connectivity.

Mobile printers from Zebra support a wide range of wireless options through modular hardware, enabling anywhere, anytime communications. Businesses can choose the wireless connectivity that best suits their needs including 802.11b/g and Bluetooth® 2.0. Because Zebra mobile printers support multiple wireless security and encryption standards, IT departments can feel confident that their networks and critical data remain secure.

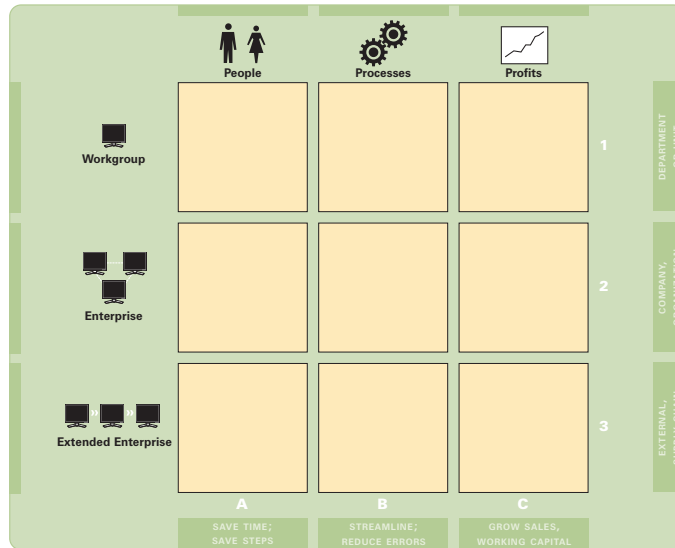
Longer Battery Life—Higher Shift Availability

How the printer manages its power supply impacts overall battery life and application effectiveness. Battery life varies widely based printer usage. Print volume, label size, the amount of wireless activity, and other factors all affect how long batteries last before recharge or replacement. It is critically important in field service applications to have enough battery life to power computers and printers for the entire shift, or workers cannot complete their daily tasks. Adapters are available so battery chargers can plug into vehicle cigarette lighters.

Users must test their applications to ensure that the batteries they use consistently perform as needed and will not contribute hidden expenses to the total cost of ownership. For example, nickel metal-hydride (NiMH) batteries have a higher initial cost than nickel cadmium (NiCAD) products, but have less performance degradation over time, are more efficient at holding their charge, and have a longer life span. Lithium-ion (Li-Ion) cells offer the highest power-to-volume and power-to-weight ratio of the three. For example, in a typical printer application, a lithium-ion battery pack producing 7.2 volts has 30 percent more power than a nickel metal-hydride pack, with half the volume and half the weight.

Mobility Boosts Field Service Profitability

The final Business Value Map contains all of the elements of the grid with their associated benefits. Field service departments can use the grid to help create the value justification for mobility projects.



Making field service operations responsive and productive requires organizations to minimize non-value-added tasks. Mobile printing is a powerful enabling technology for processes that help valuable, specialized technicians spend more time on service and less on clerical tasks. Mobile computing and printing provides all the benefits of accurate, on-site documentation, while relieving technicians of the burden of preparing the paperwork and support staff the burden of processing it. Mobile technology adopters often report unexpected side benefits and faster-than-expected return on investment (ROI).

The Zebra Business Value Map helps identify the full impact of automation and its ROI potential. Working with the map also helps businesses see their project opportunities and requirements more clearly.

Zebra Technologies Corporation (NASDAQ: ZBRA) provides the broadest range of innovative technology solutions to identify, track, manage, and optimize the deployment of critical assets for improved business efficiency. Zebra's core technologies include reliable on-demand printer and state-of-the-art software and hardware solutions. By enabling improvements in sourcing, visibility, security and accuracy, Zebra helps its customers to put the right asset in the right place at the right time. Zebra operates in over 100 countries and serves more than 90 percent of Fortune 500 companies worldwide. For more information about Zebra's solutions visit www.zebra.com.

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